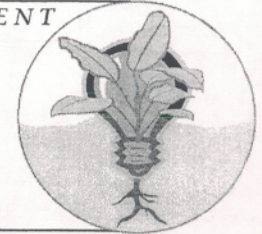


April 24, 2003



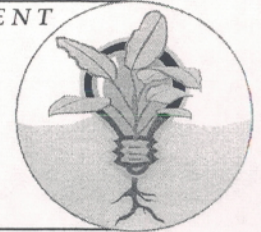


# PROGRAM DESCRIPTION

- **Systems Engineering Education Development (SEED)** is a program to take mid level discipline engineers and train them to become Systems Engineers through rotational assignments, mentoring, and formal training.
- Assignments and classes are selected to broaden the Mentee's experience across several disciplines, subsystems, and phases of the mission life cycle.
- Program length is 2 to 3 years and the graduate receives a non-competitive consideration for GS-14 engineering position.





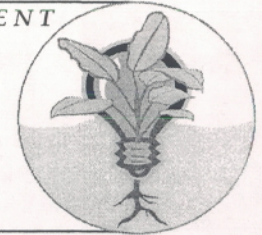


# Goals

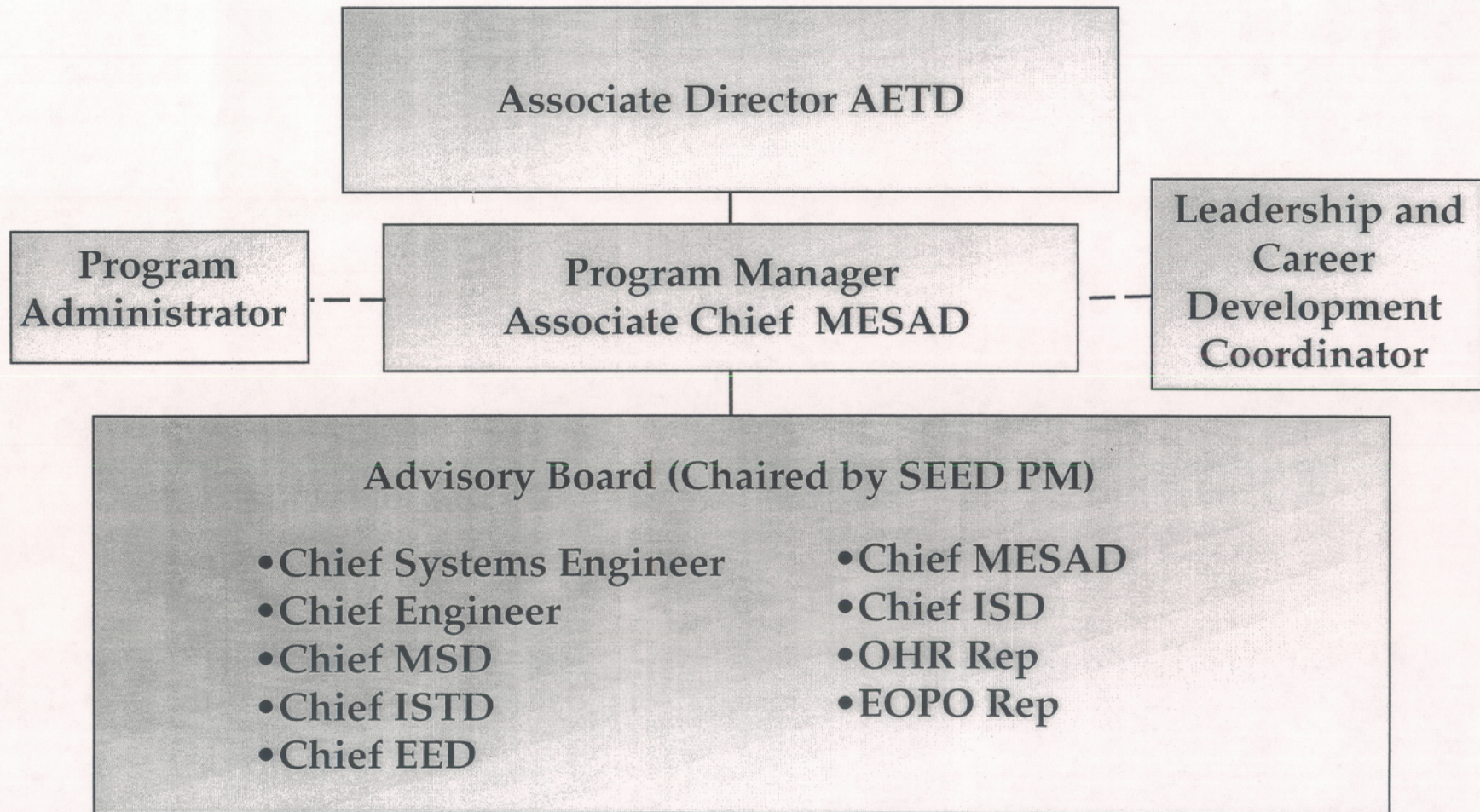
- Educate ASTs to become competent Systems Engineers.
- Provide GSFC with highly trained personnel skilled in the development of space and ground systems who can meet critical systems engineering needs.
- Provide exposure to new and different perspectives on systems engineering.
- Develop approaches for recognizing and defining problems as well as potential solutions.
- Broaden individual skills to enhance performance as a Systems Engineer.
- Support strategic systems planning.
- Prepare Mentees for the leadership aspects of Systems Engineering.



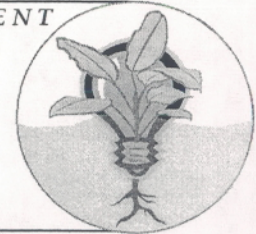




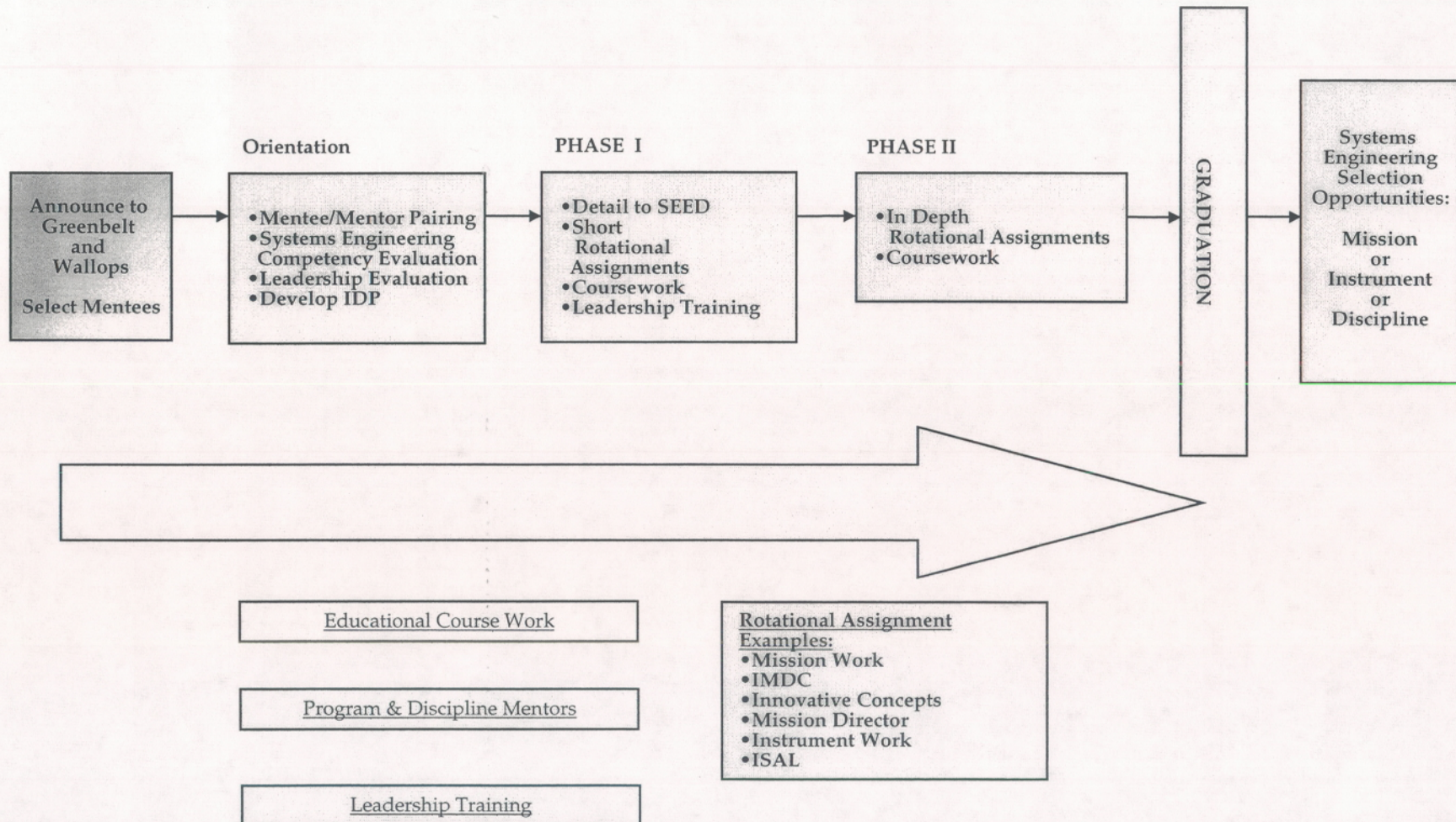
# SEED Organization



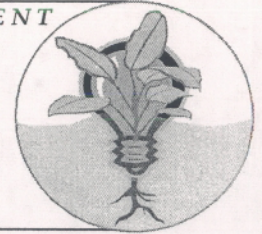




# Systems Engineering Education Path





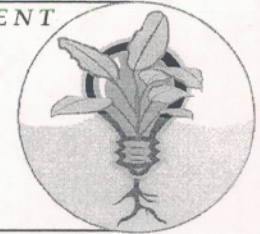


# Development of SEED Mentees

- **Orientation**
  - Mentee/Mentor pairing
  - Assess Systems Engineering & Leadership Competencies
  - Develop IDP
- **Train in essential elements of Systems Engineering**
  - Phases of the Project Life Cycle
  - Subsystems of a space mission
  - Support of Project Management
  - Leadership
- **Provide needed experiences through rotational assignments**
- **Duration of program is 2 to 3 years**
- **Certification for non-competitive selection as a GS-14 engineer awarded upon graduation.**







# TRAINING

## Core Classes

- *Technical Managers Training*
- *Systems Engineering*
- *Systems Requirements*
- *Instrument Systems Engineering*
- *System Test and Verification*
- *Continuous Risk Management*

## Leadership Development

- *4 Dimensional Leadership*
- *DISC*
- *Leadership Workshops*

## Select one of:

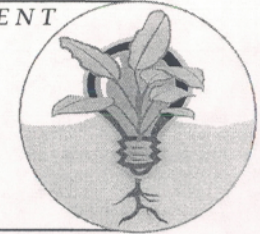
- *Space Mission Design and Analysis*
- *Designing Cost Effective Space Missions*
- *Earth Science Enterprise Mission Design*
- *Space Science Enterprise Mission Design*
- *Human Exploration & Development of Space*

## *Recommended as a follow-on to any of the above courses:*

- *Hands-on Space Mission Design Experience*





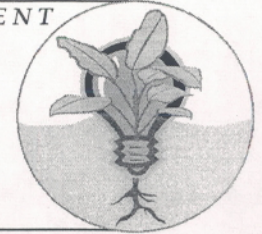


# Current Participant Status

<b>Mentee</b>	<b>Program Mentor</b>	<b>Rotational Assignment</b>	<b>Discipline Mentor</b>
Theo Bugtong Code 592 301-286-1583	John Oberright Code 592 301-286-9455	IMDC/590	Mark Steiner Code 592 301-286-5769
Becky Derro Code 544 301-286-9026	Bill Hayden Code 592 301-286-4267	COR-1/551 STEREO	Eric Mentzell Code 551 301-286-1209
Jim Kellogg Code 546 301-286-6745	Rich Barney Code 550 301-286-7531	IMDC/590	Gabe Karpatti Code 592 301-286-4468
Greg Martins Code 546 301-286-3961	Bruce Campbell Code 592 301-286-9808	FAST/STS	Joe Bolek Code 593 301-286-1390
Victor Torres Code 564 301-286-3915	Eleanor Ketchum Code 556 301-286-1170	UVOT Instrument GPM Program	Dave Everett Code 593 301 286-1596
Evan Webb Code 561 301-286-2667	Dave Everett Code 593 301-286-1596	ST5 Project New Millennium	Candace Carlisle Code 594 301-286-3427





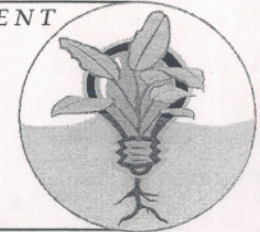


# Current SEED Status

- Each Mentee has had at least 2 rotational assignments
- All have participated in continuing leadership training
- Combined they have attended 20 required classes
- Continuing review of lessons learned







# Mentee/Mentor Comments

## Mentee Comments:

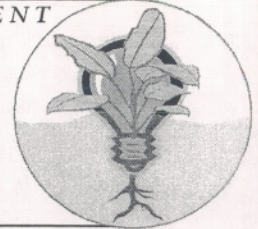
- Leadership aspect of program is very valuable
- Gained a lot of systems engineering knowledge from rotational assignments
- Training directly applicable to expected SE work
- Opens more doors to information, people are more willing to share
- SEED Staff have been very positive in trying to work with each participant's career goals
- Mentee/Mentor partnerships working well

## Mentor Comments:

- Mentee is getting comprehensive overview of Goddard Culture
- Leadership training is a real benefit
- Very rewarding having influence on next generation of SEs







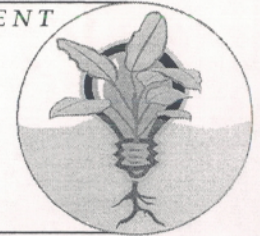
# Lessons Learned

- Provide SEED Orientation prior to SEED Phase I
  - Select Mentor/Mentee pairs
  - Assess SE and Leadership Competencies
  - Develop IDP
- Continuous improvement of SEED processes
- Perform more frequent reviews of Mentees and Program





# ISD Participation in SEED



- **Promote the SEED Program**
  - Encourage potential Mentees to apply
- **Provide Mentors**
- **Provide Rotational Assignments**



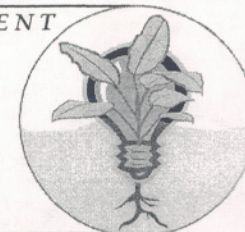


# Backup

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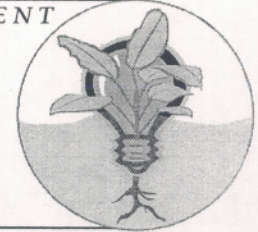
# Sample Rotational Assignments

## **Mission: LandSat Project Office; LandSat Data Continuity Mission (LDCM), Formulation Phase**

LDCM is an out-of-house mission, with two separate contractor teams working in competition on designs up to PDR, which ends the formulation phase. During formulation the Mentee is as a system engineer in the project office with the project manager, project scientist, systems manager, and others to help the two teams into designing the mission concept to eventually produce the science data. The Mentee focusing mostly on issues with the combined data systems (space/ground), but also on answering whatever technical questions come up such as the orbit definition. The Mentee will be learning a lot about the business and contracting aspects of managing an out-of-house mission.







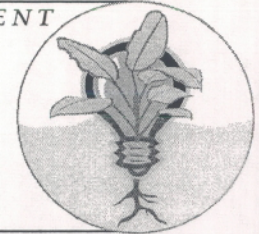
# Sample Rotational Assignments

## Development of a vibration fixture for UVOT

The Mentee will support the design and development of a vibration/thermal fixture for the Ultraviolet Optical Telescope (UVOT) of the SWIFT mission. During this assignment they interface with structural, thermal, optics and mechanical engineers and technicians to review requirements, processes and procedures needed for the development of this piece of hardware. They also interface with the instrument manager to allocate resources. The Mentee will learn concepts such as lifts and slings, the role of mechanical designers, and the issues involved in the loading and transportation of flight hardware. They will support the development of the test fixture by (a) coordinating meetings and processes, (b) finding documentation, hardware and/or people to achieve milestones, and (c) discussing issues with other engineers, civil servants and contractors, to resolve technical and logistical issues. The Mentor and Mentee will discuss what is needed to be done, how they are going to achieve it and how they are going to divide the work. They will work as a team in the development of the fixture and while the Mentor is on travel the Mentee will be required to take over. The Mentor will discuss with the Mentee the technical aspects of the design, the implications of the decisions, what alternates paths could follow in the event problems were encountered, and the possible consequences of something going wrong. Task duration 6 months.







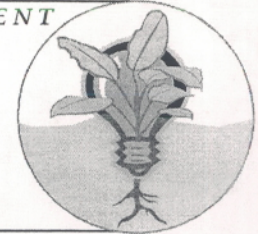
# Sample Rotational Assignments

## SEED GN&C Rotational Assignment

- The SEED Engineer will be given a rotational assignment in the GN&C Systems Engineering Branch, Code 571. The primary assignment will be to act as Deputy to the ST5 GN&C Product Lead. The ST5 GN&C Product Lead will serve as mentor during this rotational assignment. The assignment will give the SEED engineer an opportunity to work with GN&C discipline engineers in ACS analysis, ACS software, trajectory design, propulsion, GN&C hardware, as well as interface with ST5 Systems and Project personnel. The goal of the assignment is to provide an opportunity to become familiar with GN&C Systems and GN&C disciplines.
- Specific products expected of the SEED engineer will be negotiated with the ST5 GN&C Product lead, but will include:
  - Orbit Debris Assessment (Due prior to CDR)
  - ACS Requirements Specification Update
- The rotational assignment is to be completed within 6 months







# Sample Rotational Assignments

## ST5

Space Technology 5 is a New Millennium Program mission to develop and test miniature spacecraft designed to operate in the Earth's magnetosphere. The primary objectives for the ST-5 Project are to validate key technologies enabling future nanosatellite missions, and to provide a roadmap for the development, manufacture and test of a fully functional research-quality 25 kg class satellite with a recurring cost of \$1.5M or less. ST5 is being built in-house at GSFC. Currently, the mission is past CDR, breadboards and Engineering Test Units have been built and are being tested, and flight fabrication is beginning. The ST5 project provides a unique opportunity for a system engineer to be involved in the implementation, I&T, and operations phases of the mission.

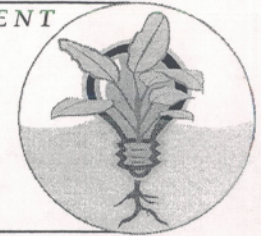
The proposed detail is for one year, with the option of remaining with ST5 through launch and its 3-month mission operations. ST5 is scheduled to launch in December 2004.

The mentee will support the following system engineering activities, reporting to the ST5 Mission Systems Engineer.

- Review and track component design and verification activities
- Lead TBD system engineering issue anomaly teams
- Review schematics, design analyses, e.g. parts derating analysis
- Participate in launch vehicle interface definition
- Develop System Verification Plan
- Develop I&T Plans, e.g. Environmental Test and Verification Plan





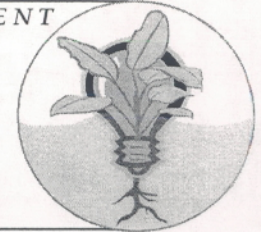


# Acronyms

- ACS - Attitude Control System
- AETD - Applied Engineering and Technology Directorate
- APPL - NASA Academy of Program and Project Leadership
- BAT - Burst Alert Telescope on the Swift Mission
- CDR - Critical Design Review
- COR - Coronagraph
- DISC - Dominance, Influencing, Steadiness, Compliance
- EOPO - Equal Opportunity Program Office
- EED - Electrical Engineering Division
- FAST - Fast Auroral Snapshot Explorer
- GN&CD - Guidance Navigation and Control Division
- GPG - Goddard Procedures & Guidelines
- GPM - Global Precipitation Measurement Mission
- GSFC - Goddard Space Flight Center
- IMDC - Integrated Mission Design Center
- IDP - Individual Development Plan
- ISAL - Instrument Synthesis Analysis Laboratory
- ISD - Information Systems Division







# Acronyms

- ISTD - Instrument Systems and Technology Division
- LDCM - LandSat Data Continuity Mission
- MSD - Mechanical Systems Division
- NET - NASA Engineering Training
- OHR - Office of Human Resources
- PDR - Preliminary Design Review
- PM - Program Manager
- SE - Systems Engineer/System Engineering
- SEACD - Systems Engineering and Advanced Concepts Division
- SEED - Systems Engineering Education Development
- SEMP - Systems Engineering Management Plan
- SLATE - System Level Automation Tool for Engineers
- ST5 - Space Technology 5
- STS - Space Transportation System (Shuttle)
- TMT - Technical Managers Training
- UVOT - Ultraviolet Optical Telescope
- VSDE - Virtual System Design Environment





